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## **The management of urinary incontinence in the male neurological patient**

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**Abstract:** PURPOSE OF REVIEW: Urinary incontinence in male neurological patients is a very frequent problem but treatment remains challenging. Thus, we summarize and highlight the latest developments in the management of urinary incontinence in this specific patient population. RECENT FINDINGS: Intermittent self-catheterization, antimuscarinics, intradetrusor injections with onabotulinumtoxinA, augmentation cystoplasty, urinary diversion, and artificial urinary sphincter are the cornerstones of the armamentarium for treating neurogenic urinary incontinence. However, with the exception of onabotulinumtoxinA intradetrusor injections, level of evidence is often low and male-specific outcomes are virtually not available. Alternative conservative and/or minimally invasive procedures such as neuromodulation techniques and suburethral suspension devices provide promising data with apparently good safety and tolerability but still insufficient evidence lacking randomized control trials. SUMMARY: Standard options for treatment of urinary incontinence in neurological patients remain largely unchanged. Alternative treatment options, especially of conservative or minimally invasive character, have the potential to further broaden the therapeutic spectrum. While a higher level of evidence is needed to assess the potential of such therapeutic approaches, randomized controlled trials in the male neurological population present a challenge. To truly advance treatment of urinary continence in male neurological patients, well-designed, multicenter studies are warranted.

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# The management of urinary incontinence in the male neurological patient

Ulrich Mehnert and Thomas M. Kessler

## Purpose of review

Urinary incontinence in male neurological patients is a very frequent problem but treatment remains challenging. Thus, we summarize and highlight the latest developments in the management of urinary incontinence in this specific patient population.

## Recent findings

Intermittent self-catheterization, antimuscarinics, intradetrusor injections with onabotulinumtoxinA, augmentation cystoplasty, urinary diversion, and artificial urinary sphincter are the cornerstones of the armamentarium for treating neurogenic urinary incontinence. However, with the exception of onabotulinumtoxinA intradetrusor injections, level of evidence is often low and male-specific outcomes are virtually not available.

Alternative conservative and/or minimally invasive procedures such as neuromodulation techniques and suburethral suspension devices provide promising data with apparently good safety and tolerability but still insufficient evidence lacking randomized control trials.

## Summary

Standard options for treatment of urinary incontinence in neurological patients remain largely unchanged. Alternative treatment options, especially of conservative or minimally invasive character, have the potential to further broaden the therapeutic spectrum.

While a higher level of evidence is needed to assess the potential of such therapeutic approaches, randomized controlled trials in the male neurological population present a challenge. To truly advance treatment of urinary continence in male neurological patients, well-designed, multicenter studies are warranted.

## Keywords

male neurological patients, neurogenic detrusor overactivity, neurogenic sphincter insufficiency, urinary incontinence, urinary incontinence therapy

## INTRODUCTION

Urinary incontinence in neurological patients is a very frequent [1] and debilitating condition resulting from the profound alterations of lower urinary tract (LUT) control and function caused by the neurological disorder. It should be implicitly considered that in neurological patients LUT symptoms such as urgency may be reduced or absent because of sensory deficits, and that urinary incontinence is often the 'only' apparent symptom of relevant LUT dysfunction requiring further specialized investigation [2<sup>•</sup>].

Therefore, it is of utmost importance not only to appropriately differentiate between the different types of urinary incontinence but also to understand the underlying neurological cause as it significantly influences the choice of treatment. Urinary incontinence related to neurogenic detrusor overactivity

(NDO) requires a completely different management than urinary incontinence related to isolated neurogenic sphincter insufficiency. Neglect of this principle may result not only in insufficient and inaccurate treatment but also in significant harm of the patient.

The scope of this article is to review the management of urinary incontinence in male neurological patients. However, data specifically considering the

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## KEY POINTS

- Treatment of urinary incontinence in male neurological patients is challenging and often requires multimodal therapy.
- Intermittent self-catheterization, antimuscarinics, intradetrusor onabotulinumtoxinA injections, augmentation cystoplasty, urinary diversion, and artificial urinary sphincter are still the cornerstones of urinary incontinence treatment in neurological patients.
- With the exception of onabotulinumtoxinA intradetrusor injections, the level of evidence of many therapy options for urinary incontinence due to neurogenic detrusor overactivity and/or neurogenic sphincter insufficiency is low.
- Current findings are mainly from multiple sclerosis and spinal cord injury patients without gender-specific outcomes limiting generalization of the results.
- RCTs are urgently needed, especially for upcoming and promising treatment options, such as neuromodulation techniques and suburethral suspension devices.

male neurological population is very rare so that we took into account neurological patients in general and referred to male-specific data whenever possible.

## MANAGEMENT OPTIONS FOR URINARY INCONTINENCE IN MALE NEUROLOGICAL PATIENTS

As therapeutic principles in male neurological patients largely depend on the underlying cause of urinary incontinence, that is, mainly NDO and/or neurogenic sphincter insufficiency, the current armamentarium focuses on treating either cause or both in mixed forms. However, prior to the appliance of any form of subvesical obstruction with the intention to treat neurogenic stress urinary incontinence (SUI), that is, suburethral slings, adjustable continence devices, and artificial urethral sphincter, it is mandatory to first adequately treat detrusor overactivity or reduced bladder compliance as otherwise increased storage pressures can jeopardize upper urinary tract function.

An often-underestimated or neglected problem in neurological patients is concomitant problems with defecation that can interfere with LUT function and should be addressed before or concomitantly with any medical or surgical urinary incontinence therapy.

### Behavioral therapy and pelvic floor exercises

Although specific studies on behavioral treatment (aiming to adapt drinking and voiding habits) in

male neurological urinary incontinence are lacking, it should be part of the first-line treatment.

Behavioral regimens have to be adapted to the individual abilities and needs of the patients and suit best for patients in whom voiding function is intact and urinary incontinence is mainly due to impaired bladder sensation, cognitive, or motor deficits. However, in such cases, caregivers need to provide additional support.

Pelvic floor muscle training (PFMT) has been mainly explored within multiple sclerosis (MS) populations with predominantly female patients [3]. In men, PFMT is primarily used to treat post-prostatectomy SUI. Nevertheless, PFMT has been shown to be beneficial in the treatment of both, stress and urgency urinary incontinence [4]. However, to be successful, voluntary pelvic floor sensorimotor control must be at least partly intact which can be a limiting factor in many neurological patients.

## Catheters

Intermittent self-catheterization (ISC) can improve urinary incontinence and is the gold standard in the management of neurogenic voiding dysfunction due to detrusor sphincter dyssynergia or underactive/acontractile detrusor. Although newer data and expert panels are in favor of single-use hydrophilic catheters in an aseptic or clean manner [5–8], the level of evidence is still low resulting in an ongoing debate on the optimal technique (sterile vs. clean vs. aseptic; single-use vs. reuse) and catheter type (hydrophilic vs. noncoated catheters) regarding the rate of UTI, urethral lesions, cost-effectiveness, and health-related quality of life (HRQoL) [9<sup>11</sup>,10–13].

Recent articles focused on the impact of ISC on HRQoL [14], patient's adherence to ISC [15<sup>16</sup>], and preferences regarding catheter design [13,16] including male-specific data [17,18].

Indwelling catheters can be effective in treating urinary incontinence and especially suprapubic catheters might be an option for highly selected populations, such as tetraplegic patients [19]. However, indwelling catheters are not recommended for routine long-term treatment because of the associated complications such as acute and chronic UTI, stone formation, urinary leakage/incontinence, erosion of meatus and urethra, fistula formation, reduction in bladder capacity, and compliance (with continuous drainage) [20,21,22<sup>23</sup>].

Condom catheters [23] or other external appliances such as drip collectors can help to control urinary incontinence and make it socially more acceptable.

## Drugs

The first-line drug treatment for NDO and subsequent urinary incontinence are antimuscarinics, that is, oxybutynin, trospium chloride, tolterodine, solifenacin, darifenacin, propiverine, and fesoterodine. Efficacy and safety of antimuscarinics are well described for the non-neurogenic overactive bladder population [24,25] but less conclusive for patients with NDO because of a limited and very heterogeneous body of studies [26<sup>22</sup>]. Nevertheless, antimuscarinics were demonstrated to significantly improve patient-reported and urodynamic outcome compared with placebo in the NDO population [26<sup>22</sup>]. However, a significant improvement of urinary incontinence could not be demonstrated [26<sup>22</sup>]. The current results are mainly based on data from spinal cord injury (SCI) or MS populations and conclusions cannot be readily extended to other neurological diseases, such as stroke or Parkinson's disease. Furthermore, effects on bladder compliance, upper urinary tract function, and HRQoL were usually not assessed and long-term data of antimuscarinics in neurological patients are very limited [26<sup>22</sup>,27].

Although some large clinical trials could demonstrate statistically significant efficacy differences between several antimuscarinics, such differences seem to remain rather marginal from a clinical viewpoint and could not be demonstrated for the NDO population [26<sup>22</sup>,28]. Differences in the safety and tolerability profiles seem to be more relevant and should be considered when choosing an antimuscarinic drug for a specific patient, especially considering central nervous side-effects [28,29].

Dose-escalating mono or combination therapy can be an option for NDO patients, requiring higher doses as urodynamic parameters could be significantly improved compared with standard dose treatment [27,30]; however, high-evidence level studies are lacking.

A recent, but rather small, study comparing the immediate and extended release forms of propiverine for NDO demonstrated better continence rates using the extended release form [31]. Transdermal or intravesical antimuscarinic applications are alternative options that may help to increase bioavailability and reduce adverse events due to the circumvention of the intestinal first pass metabolism [32], but clinical data for the use in adult NDO patients are still very limited.

Other drugs, such as phosphodiesterase inhibitors or beta-adrenergic receptor agonists, seem to become future alternatives [33,34] but have not yet been investigated for the treatment of urinary incontinence in neurological patients.

## External neuromodulation

Of the different potential treatment modalities available, tibial nerve stimulation either percutaneously (PTNS) or transcutaneously (TTNS) seems to be the currently most promising and investigated method. However, the mainstay of available data are from non-neurogenic overactive bladder patients [35,36], but some recent studies also provided data from neurological patients, that is, MS and Parkinson's disease [37–44]. However, randomized controlled trials (RCTs) are lacking for PTNS and TTNS in the neurological population, and there are currently no long-term data or systematic data on HRQoL available. Nevertheless, the benefits of PTNS and TTNS are clearly the almost inexistent adverse events and the noninvasiveness that allows performance of diagnostic measures, such as repeated MRI or home-based therapy (for TTNS).

## Intradetrusor injections with botulinum toxin

On the basis of the results of the two recent Phase III studies [45,46], intradetrusor injections using onabotulinumtoxinA received Food and Drug Administration approval in 2011 for the treatment of urinary incontinence due to NDO in adults who have an inadequate response to or are intolerant of antimuscarinics. Intradetrusor injections with botulinum toxin have been demonstrated to be safe, well tolerated and to significantly improve urodynamic parameters [47<sup>22</sup>,48], reduce LUT symptoms [47<sup>22</sup>], and improve quality of life [49<sup>22</sup>,50]. Daily urinary incontinence episodes can be reduced by 63% [47<sup>22</sup>]. These effects seem to occur regardless of concomitant antimuscarinics or neurological disorder, that is, MS or SCI [51]. However, data on the use of intradetrusor botulinum toxin injections in neurological patients other than SCI and MS are scarce but there may be an indication [52].

Injections require a cystoscopic (rigid or flexible) intervention that needs to be repeated every 6–9 months [53]. The procedure can be performed in local anesthesia in most NDO patients. There is, however, still controversy about the best technique.

Long-term data confirm the efficacy of onabotulinumtoxinA beyond multiple intradetrusor injections [54,55<sup>22</sup>], and cost-effectiveness seems to be superior to best supportive care [56<sup>22</sup>]. If the durability of onabotulinumtoxinA is greater than 5 months, intradetrusor injections seem to be more cost-effective in the treatment of refractory NDO than augmentation cystoplasty [57].

## Permanent neuromodulation with implanted electrodes

Initially, considered as unsuitable for the treatment of LUT dysfunction in neurological patients due

to the impaired neuronal innervation, sacral neuromodulation (SNM) has yet been demonstrated to be a promising treatment option for NDO [58,59]. However, there is a lack of RCTs, and it is unclear which neurological patient is most suitable for SNM [58].

Remarkably, early bilateral SNM during the phase of spinal shock could prevent NDO and subsequent urinary incontinence in complete SCI patients [60]. However, long-term results are pending and the exact mechanism of action is not well understood [61]. Nevertheless, as the method is generally appealing because of its minimally invasive and fully reversible technique, well designed and adequately powered studies are highly warranted.

### **Sacral deafferentation with or without anterior root stimulator**

This technique, also known as posterior rhizotomy, has to be strictly distinguished from the aforementioned SNM as sacral deafferentation is a specialized surgical intervention that aims to abolish NDO by transection of the afferent part of the sacral reflex arc and is not reversible. Although highly effective with up to 83% continence rates [62], if complete transection of the sacral roots S2-S5 can be achieved, it is preserved for a highly selected and well informed group of SCI patients who accept the inevitable and permanent loss of any potentially preserved sensation of the pelvis and lower limbs and sexual function (e.g., reflex erections) [63]. In combination with a sacral anterior root stimulator (Finetech-Brindley bladder stimulation system) patients can regain control of micturition and even improve erectile and defecation function. An additional benefit is that sacral deafferentation can effectively abolish autonomic dysreflexia.

However, this procedure is nowadays less frequently performed because of effective but less-invasive alternatives, such as onabotulinumtoxinA intradetrusor injections. Thus, new data are scarce. One current retrospective study is available reporting continence rates of 23% 15 years after sacral deafferentation and anterior root stimulator implantation but also 84 cases of complications requiring surgical intervention among 137 patients [64].

### **Augmentation cystoplasty**

Although there are no RCT, augmentation cystoplasty is a recommended and established treatment option for intractable urinary incontinence due to NDO but requires major abdominal surgery with interposition of an intestinal segment (usually

ileum) into the bladder and/or partial replacement of bladder by an intestinal substitute, and should be preserved for patients in whom conservative or less-invasive treatment options failed to achieve an adequate level of continence [65,66]. Importantly, this treatment should only be offered to patients who are able and willing to perform ISC. Augmentation cystoplasty can be combined with a continent catheterizable cutaneous urinary diversion to facilitate ISC in patients with limited dexterity. Recent long-term data confirm previous data on efficacy demonstrating sustained improvements in both, urodynamic parameters and symptoms [67–70].

A less-invasive version of bladder augmentation is detrusor myectomy (autoaugmentation) with lower surgical burden and complication rates, but efficacy seems to be inferior to augmentation cystoplasty [71–73].

### **Urinary diversion**

In highly selected patients cystectomy with urinary diversion becomes necessary. Cystectomy in contrast to augmentation cystoplasty requires the reimplantation of the ureters, which basically implies the risk of ureteral stenosis.

For continent urinary diversion different techniques have been described [74,75]. Regular ISC is required subsequently and specific complications include stomal stenosis, channel leakage, false passage, and stomal prolapse [75,76]. However, there is less alteration of body appearance than with incontinent diversion that is usually indicated if ISC is impossible or patient compliance is inadequate.

A recent case series in MS patients with advanced refractory NDO demonstrated an effective treatment of LUT dysfunction and associated problems with an improvement in HRQoL following incontinent urinary diversion [77]. However, the complication rate was high (55%) and the authors consider urinary diversion as an effective but rather last resort treatment option for neurogenic urinary incontinence.

### **Bulking agents**

Although bulking agents have been mainly used for the treatment of SUI in women, there are also studies in men with rather discouraging results, especially in the long term [78,79]. RCT are lacking and from the available data, bulking agents cannot be considered a durable treatment especially for more severe forms of SUI, which may be the reason that there are no current data in adult male neurological patients.



## Suspension therapy

Suburethral slings or tapes become more and more popular for the treatment of male SUI as a minimally invasive option, and different types have been introduced with success rates of 54–80% [80]. In male patients with neurogenic SUI mainly autologous fascia slings, often in combination with bladder augmentation, have been investigated predominantly in pediatric populations but also in adults, demonstrating favorable results and low complication rates [81–83]. Synthetic tapes are up-to-date rarely investigated in male neurological patients. Currently, only one small study presents promising data from a mixed adult and pediatric male neurological population treated with the AdVance sling [84]. RCT and data on long-term follow-up are lacking.

## Implants for stress urinary incontinence

Adjustable periurethral balloons might be an option in highly selected patients, but there is only one study in a mixed population of patients with neurogenic SUI demonstrating rather fair results [85].

The Artificial Urinary Sphincter (AUS) is the gold standard for the treatment of SUI and has also been investigated in the adult male neurological population demonstrating a high efficacy of 23–100% (mean 70%) continent patients [83]. However, frequent complications are erosion, infection, and mechanical/device-related failure that cause a reoperation rate for revisions and/or explantations of 7–100% [83]. Comparing complication rates between neurogenic and non-neurogenic patients revealed that patients with neurogenic SUI tend to have more frequently complications that were not related to mechanical or device-related failure [86].

A recent study suggested a less costly and less fragile alternative for SCI patients replacing the pump with a subcutaneous port to adjust cuff pressure also postoperatively and to omit the necessity to repetitively activate the pump [87]. The two most recent studies report on long-term outcomes, demonstrating persistent efficacy in 74% of patients up to 10 years [88], and on the feasibility to implant the AUS using the daVinci robot [89].

However, RCTs are actually lacking and the best site for cuff placement in male neurological patients is still a matter of debate. In male neurological patients, assessment of the ejaculatory status can be relevant as AUS placement at the bladder neck level may allow patients to achieve antegrade ejaculation [83].

## CONCLUSION

Management of urinary incontinence in male neurological patients is challenging and will usually

require a combination of different treatment options. Although the therapeutic armamentarium has been increased during the last decades providing new possibilities for clinicians and patients, the level of evidence is often low. Moreover, current findings are mainly from MS and SCI patients without gender-specific outcomes limiting generalization of the results.

The established cornerstones of neurogenic urinary incontinence therapy, such as ISC, antimuscarinics, intradetrusor onabotulinumtoxinA injections, augmentation cystoplasty, urinary diversion, and AUS, have not substantially changed. There is a clear interest in conservative and further minimally invasive therapeutic options, such as neuromodulation, either applied from external or via implantable devices, and suburethral suspension systems. Recent data are promising but further research is urgently needed. RCTs for assessing efficacy and safety of different therapies for urinary incontinence in male neurological patients are a challenge and well designed multicenter studies are highly warranted.

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## Conflicts of interest

*There are no conflicts of interest.*

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